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June 6, 1984

Mr. Harold Oseroff
Code 902
NASA/Goddard Space Flight Center
Greenbelt, MD 20771



Dear Mr. Oseroff:

This letter is intended to comprise a report for Contract NAS 5-27383, "Comparative Assessment of Landsat-D MSS and TM Data Quality for Mapping Applications in the Southeast" for the period October 15, 1983 to July 15, 1984.

Efforts have been directed at rectifications of multispectral scanner (MSS) and thematic mapper (TM) data sets for full and subscene areas, analyses of planimetric errors (RMSE_x), assessments of the number and distribution of ground control points (GCP's) required to minimize errors, and factors contributing to error residuals. At the request of Dr. Vincent Salomonson, an article "Cartographic Accuracy of Landsat-4 MSS and TM Image Data" was prepared and submitted to the IEEE Transactions on Geoscience and Remote Sensing in December, 1983. This article was published in May, 1984 and provides details on the above subjects. Copies of this article are attached.

In addition, a series of presentations have been given at scientific and technical meetings, including:

Welch, R. "Mapping Applications of Landsat-4 TM Image Data";
ASP-ACSM Fall Convention, Salt Lake City, Utah; September 18-23, 1983

Welch, R. "Cartographic Quality of Landsat-4 MSS and TM Image Data";
Pecora VIII Symposium, Sioux Falls, South Dakota; October 4-7, 1983
(invited at the request of Dr. V. Salomonson)

Welch, R. "Comparative Assessment of Landsat MSS and TM Data for
Cartographic Applications"; Landsat-5 Launch Symposium, Santa Barbara,
California; February 27-March 1, 1984 (invited by Dr. V. Salomonson)

Welch, R. "Merging Landsat-4 Digital Images with Cartographic Data Bases";
Machine Processing of Remotely Sensed Data, Tenth International Symposium,
Laboratory for Applications of Remote Sensing, Purdue University,
West Lafayette, Indiana; June 12-14, 1984 (invited)

Two other presentations were given at conferences held at the Goddard Space Flight Center on December 5-6, 1983 and April 5-6, 1984.

(E84-10138) COMPARATIVE ASSESSMENT OF
LANDSAT-D MSS AND TM DATA QUALITY FOR
MAPPING APPLICATIONS IN THE SOUTHEAST
Report, 15 Oct. 1983 - 15 Jul. 1984 (Georgia
Univ.) 3 p HC A02/MF A01

N84-26086

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CSCL 05B G3/43 00138

Other subject areas which have been under investigation include the generation of three-dimensional terrain models, comparative evaluations of the resolution of the TM in relation to land use and topographic map information content, and assessments of the impact of spatial resolution on digital classification accuracies obtained for selected land use/cover categories.

The generation of three-dimensional terrain models has been accomplished for subscene data sets by: a) offsetting the pixels in a cross-track direction proportional to elevations obtained from U.S. Geological Survey digital elevation models (DEM's) to create a synthetic stereo model; and b) rectifying the sidelap area between adjacent Landsat TM scenes to ground control points common to both scenes. In both cases, the stereo model is displayed on the CRT as an anaglyph image.

These techniques are very effective in creating a 3-D image. However, the synthetic stereo image suffers from obvious sharp breaks and abnormally flat areas believed to be due to inaccuracies in the DEM created by correlation errors in difficult terrain areas.

The 30m resolution of the TM provides data which is significantly better for visual interpretation tasks than that of the MSS. Visual interpretation of TM and thematic mapper simulator (TMS) images of the Athens, Georgia area indicate that land use/cover classification accuracies of 70 to 80 percent can be achieved for 21 Level II/III (USGS) classes. Completeness of information relative to that shown on topographic maps of 1:24,000 to 1:100,000 scale is on the order of 60 to 65 percent, indicating that the TM data is much better suited to land use mapping than to topographic mapping.


Digital classifications of TM data for urban and urban/rural fringe areas produce classification accuracies of approximately 50 percent for generalized Level II classes for all combinations of spectral bands. Accuracies approaching 80 percent are achieved if the land use/cover classes are aggregated to Level I. Overall, early tests do not indicate any significant gains in digital classification accuracies when using the 30m TM data.

For the next three month period, studies will continue on stereo and perspective terrain displays, techniques for improving rectification accuracies and methods for integrating TM image data with other data bases. To date, the studies have been hampered by the lack of additional TM acquisitions over the study sites and the absence of targets suitable for the proposed MTF analyses. Because of these problems, studies of multitemporal registration accuracies and quantitative assessments of sensor performance have not been possible.

Mr. Harold Oseroff
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The above report is a brief summary of activities over the last nine months. Please do not hesitate to call me if further information is required.

Sincerely yours,



Roy Welch
Research Professor

RW:km
Enclosure

cc: Sharon Allen